WHAT IS CLAIMED IS:

1. A method for manufacturing a function device comprising:

a step of preparing a structure including columnar members and an area surrounding each of said columnar members;

a step of removing said columnar members from said structure to form a porous body; and

a step of filling said porous body with a functional material.

2. The method for manufacturing a function device according to claim 1,

wherein in said structure, said columnar members comprised of a first material are surrounded by said area comprised of a second material, and

the proportion of the second material to the total amount of the first material and the second material in the structure is in the range from 20 atomic % to 70 atomic %.

3. The method for manufacturing a function device according to claim 1 or 2, wherein the diameter of said columnar member is 50 nm or less.

4. The method for manufacturing a function device according to claim 1 or 2, wherein the center-

to-center distance between centers of said columnar members is 30 nm or less.

5. The method for manufacturing a function device according to claim 2, wherein said first material is aluminum and said second material is silicon or a mixture of silicon and germanium.

6. The method for manufacturing a function device according to any one of claims 1 to 5, wherein said functional material includes a conductive material, a magnetic material, a luminescent material and a semiconductor material.

7. The method for manufacturing a function device according to any one of claims 1 to 6, wherein the length in the depth direction of columnar pores of said porous body is substantially equal to the thickness of the area surrounding said pores.

8. A function device characterized by being obtained by filling a functional material into a porous body obtained by removing said columnar members from said structure comprised of columnar members and an area surrounding each of said columnar members.

9. The function device according to claim 8, wherein in said structure, said columnar members comprised of a first material are surrounded by said area comprised of a second material, and the proportion of the second material to the total amount of the first material and the second material in the structure is in the range from 20 atomic % to 70 atomic %.

10. The function device according to claim 8 or 9, wherein said first material is aluminum and said second material is silicon or a mixture of silicon and germanium.

11. The function device according to any one of claims 8 to 10, wherein said functional material includes a conductive material, a magnetic material, a luminescent material and a semiconductor material.

12. The function device according to any one of claims 8 to 11, wherein the length in the depth direction of columnar pores of said porous body is substantially equal to the thickness of the area surrounding said pores.

13. A function device obtained by filling a porous body with a functional material,

wherein said porous body includes a plurality of columnar pores and an area surrounding the pores, and

the area is an amorphous area comprised of C, Si, Ge or a combination of these materials.

14. The function device according to claim 13, wherein said amorphous area is an area including oxide.

15. The function device according to claim 13, wherein said columnar pore has substantially no branch.

16. The function device according to any one of claims 13 to 15, wherein the average distance between centers of said pores is 30 nm or less.

17. The function device according to any one of claims 13 to 16, wherein the diameter of said columnar pore is 20 nm or less.

18. The function device according to any one of claims 13 to 17, wherein said pores have substantially the same depth direction.

19. The function device according to any one of

claims 13 to 18, wherein said oxide amorphous area includes aluminum.

20. The function device according to any one of claims 13 to 19, wherein said porous body is formed on a substrate and the depth direction of said columnar pores is almost perpendicular to said substrate.

21. A perpendicular magnetic recording medium comprising a base layer and a recording layer on a substrate,

characterized in that the recording layer comprises columnar members comprised of a magnetic material and an area comprised of silicon, SiGe, or oxide thereof and surrounding the columnar members, said base layer has a square crystalline array in the in-plane direction of the substrate, and the columnar members include a hard magnetic material portion comprised of an $L1_0$-ordered structure c-axis-oriented in the direction perpendicular to said substrate.

22. The perpendicular magnetic recording medium according to claim 21, wherein said hard magnetic material portion is comprised of MPt (M=Co, Fe, Ni).

23. The perpendicular magnetic recording medium

according to claim 21, wherein said hard magnetic material portion comprised of structure includes at least one element selected from the group consisting of Ag, Pd, Ir, Rh, Cu, Cr, P and B.

24. The perpendicular magnetic recording medium according to any one of claims 21 to 23, wherein the portion of said columnar members excluding the hard magnetic material portion is a structure having a square crystalline array parallel to the plane of the substrate.

25. The perpendicular magnetic recording medium according to any one of claims 21 to 23, wherein the portion of said columnar members excluding the hard magnetic material portion has an fcc structure or an $L1_2$-ordered structure.

26. The perpendicular magnetic recording medium according to claim 25, wherein the fcc structure portion of said columnar members has a structure comprised of any one selected from the group consisting of precious metal, Cu and NiFe as a main component, and the $L1_2$-ordered structure has a structure comprised of M_3Pt (M=Fe, Ni) or MPt_3 (M=Co, Fe).

27. The perpendicular magnetic recording medium according to claim 26, wherein the $L1_2$-ordered structure portion of said columnar member is comprised of Fe_3Pt or $FePt_3$.

28. The perpendicular magnetic recording medium according to any one of claims 21 to 27, wherein said columnar members are provided with an $L1_2$-ordered structure comprised of $Fe_3Pt/L1_0$-ordered structure comprised of FePt/base layer or an $L1_0$-ordered structure comprised of $FePt/L1_2$-ordered structure comprised of $FePt_3$/base layer, in that order from the top portion to the base layer.

29. The perpendicular magnetic recording medium according to claim 21, wherein the layer comprised of silicon oxide having said pores consists of $(Al_XSi_{1-X})_YO_{1-Y}$, where X is in the range 0.01 to 0.2.

30. The perpendicular magnetic recording medium according to claim 21, wherein the average diameter of the columnar members filled in said pores is in the range 1 to 9 nm and the average distance thereof is in the range 3 to 10 nm.

31. The perpendicular magnetic recording medium according to claim 21, wherein the layer comprised of

SiGe oxide having said micropores consists of $(Al_X(Si_yGe_{1-y})_{1-X})_zO_{1-z}$, where X is in the range 0.01 to 0.2, and y is in a range of $0<y<1$.

32. The perpendicular magnetic recording medium according to claim 21, wherein the average diameter of the columnar members filled in said micropores is in the range 1 to 15 nm and the average distance is in the range 3 to 20 nm.

33. The perpendicular magnetic recording medium according to claim 21, wherein said base layer has an fcc structure, or any one of ordered structures $L1_0$, $L1_1$ and $L1_2$.

34. The perpendicular magnetic recording medium according to claim 21 or 31, wherein said base layer has an fcc structure predominantly comprised of any one of precious metal, Cu or NiFe, an $L1_0$-ordered structure predominantly comprised of MPt (M=Co, Fe, Ni), $L1_1$-ordered structure predominantly comprised of CuPt, or $L1_2$-ordered structure predominantly comprised of any one of M_3Pt (M=Fe, Ni) or MPt_3 (M=Co, Fe).

35. The perpendicular magnetic recording medium according to claim 21, wherein an MgO (001) layer is

placed below said base layer.

36. A magnetic recording/reproduction apparatus using the perpendicular magnetic recording medium according to any one of claims 21 to 35.

37. An information processing apparatus using the magnetic recording/reproduction apparatus using the perpendicular magnetic recording medium according to any one of claims 21 to 36.

38. A method for manufacturing a perpendicular magnetic recording medium having a base layer and a recording layer on a substrate, comprising:

a step of forming a base layer having a square crystalline array in the in-plane direction of said substrate;

a step of forming a structure having columnar aluminum portions comprised of aluminum standing in the direction perpendicular to the substrate on said base layer, silicon or SiGe placed in such a way as to surround the sides of said columnar aluminum portions;

a step of removing the columnar aluminum portions of said structure to form micropores and oxidizing said silicon portion or said SiGe portion; and

a step of forming a portion predominantly comprised of MPt (M=Co, Fe, Ni) in said micropores by means of electrodeposition, then annealing and forming a recording layer provided with a columnar member including a hard magnetic material having an $L1_0$-ordered structure which is c-axis-oriented in the direction perpendicular to the substrate.

39. A perpendicular magnetic recording medium having a soft magnetic material layer and a recording layer on a substrate, characterized in that said soft magnetic material layer is constructed by including columnar soft magnetic materials and a non-magnetic material area surrounding said soft magnetic materials.

40. The perpendicular magnetic recording medium according to claim 39, wherein said non-magnetic material includes $Al_X\ Si_{1-X}$ (X=0.01 to 0.2) or the oxide thereof as a main component.

41. The perpendicular magnetic recording medium according to claim 39, wherein said non-magnetic material includes Al_XSi_{1-X} (X=0.01 to 0.2) and a component material of the columnar soft magnetic material as a main component.

42. The perpendicular magnetic recording medium according to claim 39, wherein the average diameter of said columnar soft magnetic materials is 1 to 9 nm and the average distance is 3 to 10 nm.

43. The perpendicular magnetic recording medium according to any one of claims 39 to 42, wherein said columnar soft magnetic materials are comprised of NiFe.

44. The perpendicular magnetic recording medium according to claim 39, wherein a base layer made up of a single or 2 or more non-magnetic conductive films is provided between said substrate and said soft magnetic material layer.

45. The perpendicular magnetic recording medium according to claim 39, wherein a base layer made up of a single or 2 or more non-magnetic conductive films is provided between said soft magnetic material layer and said recording layer.

46. A magnetic recording/reproduction apparatus using the perpendicular magnetic recording medium according to any one of claims 39 to 45.

47. An information processing apparatus using

the magnetic recording/reproduction apparatus using the perpendicular magnetic recording medium according to any one of claims 39 to 46.

48. A method for manufacturing a perpendicular magnetic recording medium having a substrate and a soft magnetic material layer and recording layer arranged on said substrate, characterized by comprising:

a step of forming on the substrate, columnar structure sections predominantly comprised of aluminum and a non-magnetic area predominantly comprised of silicon arranged in such a way as to surround said columnar structure sections; and

a step of forming a soft magnetic material layer by replacing the columnar structure sections predominantly comprised of aluminum by columnar soft magnetic materials.

49. A method for manufacturing a magnetic recording medium, characterized by comprising:

a first step of providing a structure made up of columnar members comprised of a first material and an area comprised of a second material surrounding said columnar structures, the proportion of the second material of which is 20 atomic% or above and 70 atomic% or less of the total amount of said first

material and said second material;

a second step of removing said columnar members from said structure; and

a third step of filling the porous body formed in said second step with a magnetic material.

50. A magnetic recording medium comprised of a substrate and a recording layer, characterized in that said recording layer is provided with columnar members comprised of a magnetic material and an area comprised of silicon, SiGe or oxide of these elements surrounding said columnar members.